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ABSTRACT

To investigate the effectiveness of three variables in machine mediated small-group instruction, a three-year study is being conducted with 90 undergraduate and graduate students divided into groups of 15. Forms of media presentation, levels of learning and forms of feedback are varied among the groups, and their interactive as well as independent values studied. Among questions being investigated are: Which supportive visual media works best with audio-based instruction? What are the effects of the three forms of media on the acquisition of facts, concepts and skills? What form of feedback is best for an incorrect response? Conclusions will be given at the end of the study, now in its second year. (SK)

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AN EXPERIMENTAL STUDY USING COLLEGE STUDENTS COMPARING FORMS OF AUDIO AND VISUAL INSTRUCTION WITH FORMS OF FEEDBACK IN GROUP PACED PROGRAMMED INSTRUCTIONAL SEQUENCES

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PURPOSE AND OBJECTIVES

The purpose of this study is to investigate the effectiveness of three variables in machine-mediated small group instruction. The following variables are being studied:

(a) forms of media presentation

(b) levels of learning

(c) forms of feedback

The three variables are being looked at in terms of their interactive as well as independent values.

The following questions are being considered inworking toward the final conclusion:

1. Which supportive visual media works best with audio based instruction: printed materials, slides, or television?
2. What are the effects of the three forms of media on the acquisition of facts, concepts, and skills?
3. What form of feedback is best for an incorrect response - indicating incorrectness with no additional information, revealing the correct response, or revealing the correct response with additional pertinent information?

NEED

In many classrooms of higher education, much of the instructor's time is spent lecturing over material which is concerned merely with familiarizing students with vocabulary definitions and teaching simple concepts. Sometimes

the instructor's time is spent demonstrating simple skills which the students are to learn. The instructor in such cases is reduced to performing machine-like functions and devoting classroom time to things which could well have been learned outside the classroom. As well as this, students do not often study effectively on their own time. Their studies consist of the use of textbooks and class notes which subsequently demand the study of material after each lecture rather than study before each lecture. Because of this arrangement, the main objective of study is not so much to be prepared for the upcoming class as it is a last ditch effort in preparing for an exam. Discussions are difficult to conduct under such circumstances. Group activities are next to impossible to implement, so the instructor must usually carry the load himself. This engenders spoonfeeding and lectures which can easily dissipate into boredom.

Study habits and study skills vary considerably and can be considered to a great extent an individual process. Modes of learning, memorizing patterns, speed of comprehension, repetition, communication differences and many other factors require much careful attention to information processing for methods of study. Many times small group activities and instruction can be used to advantage for econmic and functional reasons.

REVIEW

In many disciplines and subsequently in most instructional processes, a portion of the content is devoted to learning vocabulary, relationships, and skills. In most cases, this can be accomplished by individualized study or by small group instruction. Small group instruction is often considered an efficient method for learning.

Research studies indicate that programmed instruction used with instructional materials may be applied to small groups with as much instructional value as when applied to individuals. When newer media are combined into a system for group-paced instruction, these media (such as, television, films, and tapes) facilitate a more efficient presentation. In the last twenty-five years, several studies were made which focused on various aspects of group-paced programmed instruction.

Carpenter (1950) reported the use of the Classroom Communicator, a specially wired classroom, in which each seat was equipped with partially concealed response buttons. Multiple choice questions concerning projected film content were answered by each student using these response buttons. Responses were recorded on the instructor's panel. Responses were reinforced by showing the correct answer on the screen following each question. No studies were made to compare this particular form of group-paced instruction with other forms of group-pacing or with self-paced instruction, because the Classroom Communicator was not designed for that particular research function but to rate films instead.

If group-paced materials are to be considered an effective instructional aid, it must be ascertained if a person can be instructed as well at various pre-determined rates of pacing as he can at his own set rate.

Test results from studies conducted by Carpenter and Greenhill (1963) supported the hypothesis that students have a relatively wide tolerance to various pre-determined rates of instructional pacing only for some forms of learning. In a series of six experiments with college students studying two different programmed courses in algebra and English grammar, Carpenter and Greenhil examined the possibility of programming entire courses in these two subjects, and they made a comparison of different methods and media.

The test scores of the groups using group-paced instruction did not vary significantly from the scores attained from the self-paced groups. It was concluded that group-paced instruction, under certain circumstances, could instruct as well as self-paced instruction and should receive further research attention. The experimenters suggested, "Test the generality of findings by extending the research to other levels of formal instruction, to the elementary level at one extreme, adult and professional training at the other." Carpenter added, "Most learning is personal and individual, whether the student studies in isolation or in classes large or small, dispersed or assembled."

Another group of studies tested various conditions in which programmed instruction was used only in a group setting. One such variation was the use of multi-sensory stimuli.

When an audiovisual approach was compared with an audio stimulus alone in a study of sixth graders, Westley and Barrow (1959) reported no statistically significant differences. However, Hartman (1961), in a study of multi-channel learning, concluded that audiovisual stimuli were more effective than verbal stimuli used alone. He observed, though, that it was difficult to assess learning in such situations. His multi-sensory approach used an audio stimulus with printed material.

The Carpenter study (1950) used more than one sensory stimulus in its programmed instruction. Two stimuli, audio and visual, were used together in the multi-sensory approach. It appeared to facilitate the use of programmed instruction in a group setting.

Multi-sensory learning in any instructional design, programmed or otherwise, was questioned by Travers (1964). He believed that many of the earlier experiments on the relative value of transmitting redundant information through two sensory channels had been unsatisfactory. Travers, along with

others at the University of Utah, conducted a series of experiments with multi-sensory comparisons using seventy-two college students. They concluded, "...there were no real differences in the relative efficiencies of these modes (audio, visual, audiovisual) of presentation except when the stimulus material is of highly ambiguous or non-organized nature or when some other factor such as age, or reading ability, is operating."

The above cited studies indicate that group-paced instruction utilizing aspects of programmed learning can be a significant form of instruction. Also, multi-sensory instruction with the newer media such as television can be used successfully under particular circumstances.

Some form of feedback is generally considered essential for retention of learning. When students are given the opportunity to respond to questions related to the material during or after a lesson, retention is improved. Furthermore, when lessons are designed with frequent questions interspersed throughout the material, re-adjustment of the student's behavior can be made immediately. To be more specific, one could use television and slide/tape presentations to supply instruction along with a responder system providing immediate feedback.

Fulton (1969) at Southern Illinois University, Carbondale, used the student responder system to test the effects of immediate and delayed information feedback on retention. After administering five multiple choice tests with a two week delay, criterion changes in scores were examined. It was found that immediate feedback was superior to delayed feedback in periods froms thirty to fifty-eight days in duration. Working from the premise that immediate feedback is considered beneficial to retention, the next step is to consider what kinds of feedback are more effective.

Sturges (1969) used two treatments: (1) exposing the correct response and (2) exposing the correct response along with the incorrect alternatives. Both treatments used immediate and delayed feedback. Superior retention was found when immediate feedback was used with the second treatment. An extension of such investigations appears necessary. This could be done by exploring kinds of immediate feedback and their relative value in retention of information.

In the present investigation, the use of television or slides as the mode of instruction coupled with the student responder system is proposed as an aid in the control of instructional conditions. The combining of these two instructional devices will be designated as a systems approach, since the two components are synchronized to accomplish a task facilitating both the sending of information and transmission of feedback.

A systems approach to instruction can facilitate the manipulation of specific variables in learning. Effectiveness of feedback can be efficiently investigated because of the very nature of the student responder system and of the controlled instructional presentation with the media. It is proposed that if feedback information is added to the instructional sequence at any of the lower levels of learning, then achievement in group-pacing could be better facilitated.

METHOD

A. Sample

The sample consists of undergraduate students enrolled in the basic audio-visual course of the Instructional Technology Department at Southern Illinois University at Edwardsville. Approximately ninety students are used each quarter. The subjects are divided into small groups of fifteen and are required to remain in the same group throughout their quarter's enrollment in the class.

B. Apparatus

1. A responder system which also incorporates an audio automated instructional system is being used along with television and projection equipment. The responder system has sixteen stations installed in carrels.

2. A learning laboratory equipped with a sixteen booth study carrel system. Each booth contains four push buttons, a red and green light, and headphone connections. Each booth is connected by cables to a control center which is constructed in such a way as to automatically operate each booth separately for question response items. The center operates from a tape deck. The control center also has a display panel for instructor observation. The laboratory also is equipped with TV monitors, a viewing screen, video tape deck, and carousel projectors.

3. A production studio has also been set up which contains a two camera video system with a small control room to produce the materials for the project. A simple darkroom has been outfitted for black and white photography to be basically used for the TV photo graphics.

C. Procedure

This project is basically divided into two levels. The first level is the production of material. The second level contains three phases, all dealing with instruction.

Level I. The instructional materials are being produced locally. This is being done so that the programmed sequences will be compatible with the specific instructional system being used. Furthermore, the production of materials is designed in three forms: video tape, slide tape, and

booklets and tape. In all three cases the audio content is held constant. Lessons are first scripted, tried out, edited, and then video taped. After pilot testing of the video tape and revision, a final tape is produced. Slides are then shot of the same lesson in color and synchronized with the sound. Finally, an expanded form of the script is duplicated to be used with audio.

Production is handled in a specially set up television facility. Television graphics are also specially produced in our own darkroom. Production equipment has been purchased for this project.

Level II. In the second level of the project, where data collection will take place, the instructional materials will be implemented. There are three phases of study in this implementation.

Phase 1.

Approximately ninety undergraduate and graduate students who have enrolled in the Instructional Technology (I.T.) 417 course are being used for the study. Each of the groups are being assigned to one of the following treatments:

Rote learning using audio-based presentations
Rote learning using visual-based presentations
Rote learning using audio-visual presentations

Sequential fact attainment using audio-based presentations
Sequential fact attainment using visual-based presentations
Sequential fact attainment using audio-visual presentations

Repetitive conceptual learning using audio-based presentations
Repetitive conceptual learning using visual-based presentations
Repetitive conceptual learning using audio-visual presentations

A one-way analyses of variance will be run with the criterion variable being a residualized gain score for the amount learned in each of the three learning modalities. The independent variable is the type of presentation. This Phase will be replicated during a second quarter.

Phase 2.

Phase 2 will utilize the best presentation from Phase 1 and concentrate on forms of supportive media (printed materials, slides, or television). Again, students are being randomly assigned to one of the following groups:

Rote learning using presentation with printed material(pm)
Rote learning using presentation with slide materials (sm)
Rote learning using presentation with television (tv)

Sequential fact attainment using presentation with printed material (pm)
Sequential fact attainment using presentation with slide materials (sm)
Sequential fact attainment using presentation with television (tv)

Repetitive conceptual learning using presentation with printed material (pm)
Repetitive conceptual learning using presentation with slide materials (sm)
Repetitive conceptual learning using presentation with television (tv)

A one-way analyses of variance will be run with the criterion variable being a residualized gain score for the amount learned in each of the three learning modalities. The independent variable is the type of visual supportive media. Phase 2 is being replicated during the following quarter.

Phase 3.

Phase 3 deals with three forms of informational feedback (using confirmation lights only, revealing the correct answer, or revealing the correct answer with additional information). Presentation and supportive materials will be determined by Phase 2.

A one-way analyses of variance will be run with the criterion variable being a residualized gain score for the amount learned in each of the three learning modalities. The independent variable is feed-back forms. Phase 3 is being replicated during the following quarter.

DISCUSSION

This project is completing its second year and, according to its timetable, it is behind. Due to overcrowded conditions on campus, the learning laboratory

cannot be set up for long periods of time. Data collection of treatments has therefore been slowed up. In the meantime, we are concentrating more heavily on producing materials. Presentations include instruction on the operations of basic audiovisual equipment. Two additional areas are being produced in concepts pertaining to listening skills and learning space. We have learned to produce all of this on a low budget. We have established a two camera video studio and a simple black and white film production area. Our project includes one half-time research assistant and one student aide. Volunteers frequently are used in final productions.

Two pilot test sessions were conducted in the Spring of 1974. Sixteen students participated in each of the sessions which dealt with the operation of audiovisual equipment. Students responded correctly an average of eighty-five percent of the time. Aside from the student performance, information was assessed in other related areas during the pilot. Students has suggestions in the areas of question format and displaying questions on the screen. The students also preferred color slides to black-and-white videotape.

There is a monthly newsletter sent out for the project entitled Experimental Learning Concept Project. The newsletter performs three functions:

1. describing the progress of the project.
2. describing the new role of humanism in learning using the newer media
3. gaining further campus support for the project.

SUMMARY

This is a three year university funded research project. It is now in its second year. It is not sponsored by the Instructional Technology Department but the general Research Department of the University. Although all the material produced to date pertains to education in the area of Instructional Technology, we are seeking outside funding in order to expand and extend the

the project. Hopefully assistance can be given to other departments. in the university.

This project is encompassing a multiple concept of instructional processes. It is one way to approach the complicated learning process from the angle of machine-mediated instruction.